

S E C R E T

OSA-2693-69

14 October 1969

MEMORANDUM FOR: Director of Special Activities

THROUGH : Deputy for Operations/OSA

SUBJECT : Report of Tests and Evaluations

REFERENCES : (1) Memorandum for DD/SA OSA-0041-69  
dated 9 Jan 1969

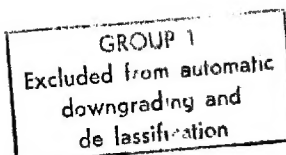
(2) Memorandum for DD/SA OSA-0029-69  
dated 21 Jan 1969

(3) Memorandum for D/SA OSA-1081-69  
dated 20 June 1969

(4) Memorandum for Record OSA-1083-69  
dated 28 July 1969 Attachment #1

1. This memorandum is for your information.
2. The referenced memoranda provide a history of the proposed thermal layer to be installed in the S1010 PPA for cold-water-immersion protection.
3. This report describes the final evaluation, conclusions, and proposed recommendations with respect to the thermal layer protective assembly.

S E C R E T



S E C R E T

OSA-2693-69  
Page 2

4. The equipment described in the final report is unclassified as before and distribution will be made to all related pressure-suit programs.

[Redacted Box]  
MAJOR USAF BSC  
AMS/OSA

25X1A

Attachment  
As stated above

25X1A

AMS/OSA [Redacted Box] em [Redacted Box]  
Distribution:  
1 - Addee w/att  
1 - D/O/OSA w/att  
1 - C/Idea/O/OSA w/att  
1 - SAS/O/OSA w/att  
1 - AMS/OSA w/att  
1 - " w/o att  
1 - RB/OSA w/o att

S E C R E T

EVALUATION OF COLD-WATER  
SURVIVAL PROTECTION PROVIDED  
BY THE S-1010 PILOT S PROTECTIVE  
ASSEMBLY UTILIZING A THERMAL  
PROTECTIVE LAYER

FINAL EVALUATIONS  
5 OCTOBER and 6 OCTOBER 1969

25X1A  
MAJOR      USAF      BSC

15 October 1969

CONTENTS

1. Background
2. Method
3. Results
4. Discussion

Table 1

Table 2

1. Background -

Testing of the S1010 PPA in cold-water immersion is of record in previously cited memoranda. For this final evaluation exercise, it was necessary, because of the season, to artificially create a cold environment. The Climatic Chamber at the School of Aerospace Medicine, Brooks AFB, San Antonio, Texas, was selected as an ideal test location.

2. Method -

An engine shipping cover, which served as the water immersion tank was placed in the cold chamber. Pre-chilling to 15° F ambient temperature along with four-hundred (400) pounds of block ice were sufficient to lower the water temperature to 40° F. A thermal layer, orally inflatable, was installed in a S1010 PPA which would adequately fit the test subjects. A change in design from previous models of this garment allowed for the oral inflation tube to penetrate the suit on the left arm. This modification provided for easier inflation than in the original design wherein the tube came out at the right wrist. Inflation of both the raft floor

- 2 -

and the hood were accomplished with the prototype bilge pump and all tasks were performed but with some effort on the part of the subjects. For the final test the suit was donned and the subjects placed in the water tank cooled to 40°F.

### 3. Results -

Charts 1 and 2 illustrate the events, temperatures, time periods, and comments of observers and subjects. In comparing earlier exposures without the thermal layer, it becomes apparent that much added protection is provided with the air space created by the thermal garment. Little or no discomfort was experienced by either subject while in the water. Once in the raft and enclosed inside the inflatable hood and floor, the subject experienced no adverse effects and was, in fact, quite comfortable. After two (2) hours, the experiment was terminated since 40°F water temperature was difficult to maintain.

### 4. Discussion -

Survivable immersion time in cold water has been extended noticeably with the use of the thermal protective layer. Pilot acceptance will depend upon fit and comfort; however, since pressure-suit easements have been increased, it is felt that for the added protection the garment will be well tolerated. A thermal layer is presently being fabricated for installation in an operational S1010 PPA for pilot acceptance studies.

SUBJECT: 

TABLE #1

25X1A

TIME	EVENTS	TEMPERATURE (°F)				REMARKS
		ORAL	AIR	WATER	RAFT GARMENT PRESSURE	
300	Suit donning	98.6	70	--	--	Suit was donned in a cool environment vent air used until exposure in water
325	Entered water and inflated garment	99.6	15	41	-- 40 mhg	No severe coldness noted on entry - difficult inflating garment - inflation hose to be elongated
350	Water immersion period	99.3	15	40	-- 30 mhg	Coldness noted especially in extremities no shivering
355	Boarded life raft re-inflated garment	99.3	15	40	-- 40 mhg	During period of inflation - some exertion experienced in accomplishing inflations - hand pump was used for these tasks and to pump water out of raft
405	Inflated floor and hood	--	15	40	20 40 mhg	
420	Raft period	99.3	15	40	-- 40 mhg	Quite comfortable in raft closed up and almost dry
455	Raft period	98.4	15	40	-- 40 mhg	
510	Re-entered water	98.0	15	40	-- 40 mhg	Some coldness noted on re-entry no shivering as yet
520	Water immersion	97.0	15	40	-- 40 mhg	Beginning to shiver
525	Ended test - left water	97.0	15	40	--	Shivering experienced until after doffing suit within 10 minutes completely recovered

SUBJECT: 

TABLE #2

		TEMPERATURE ( °F)					25X1A
TIME	EVENTS	ORAL	AIR	WATER	RAFT	GARMENT PRESSURE	REMARKS
030	Suit donning	98.6	32	37	--	--	Suit donned in a cool environment vent air used until exposure in water
002	Entered water and inflated garment	98.6	32	37	--	40 mhg	No severe coldness upon water entry also experienced difficulty inflating garment
017	Water immersion period	99.4	32	37	--	40 mhg	No discomfort
032	Water immersion period	97.	32	37	--	40 mhg	Slight shivering
034	Ended test Pulled from water	97.	32	37	--	--	Some shivering until after doffing suit Returned to normal almost immediately



## ROUTING AND RECORD SHEET

SUBJECT: (Optional)

FROM:

AMS/OSA

EXTENSION

4416

NO.

OSA-2693-69

DATE

15 Oct 69

TO: (Officer designation, room number, and building)

DATE

RECEIVED

FORWARDED

OFFICER'S INITIALS

COMMENTS (Number each comment to show from whom to whom. Draw a line across column after each comment.)

1. C/AMS/OSA Review

14 Oct 24

2. D/O/OSA Review

15 Oct B

3. EO/SA Review

16 Oct P

4. DD/SA Review

16 Oct M

5. D/SA

15 Oct

6. C/AMS/OSA

7.

8.

9.

10.

11.

12.

13.

14.

15.

Very interesting - obviously thermal cages will increase survivability.